**Incomplete Dominance and Codominance Worksheet**

1. When a true-breeding blue geranium (a type of flower) is crossed with a true-breeding red geranium, it produces a purple geranium. What would be the genotypic and phenotypic ratios of the offspring of the cross between two purple geranium? What are the odds of producing red offspring?

**What type of inheritance is it? How do you know?**

1. **Write a Let Statement (Remember, we use genes with superscript)**

Let CB represent the

Let CR represent the

1. **Identify the genotypes of the parents**

Blue Parent 🡪 Gametes: Red Parent 🡪 Gametes

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1. **Set up the Punnett Square**
2. **4. Complete it! 5. Figure out Phenotypic and Genotypic Frequencies**

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**6. Answer the question**

2. Black and white coloured feathers are codominant in chicken. Chicken who have both alleles end up speckled (they have black feathers and white feathers). What is the chance that a black chicken and white chicken will produce speckled offspring?

**What type of inheritance is it?**

**1Write Let Statements (Remember, we use genes with superscript)**

1. **Identify the genotypes of the parents**

Parent 1 🡪 Gametes: Parent 2 🡪 Gametes

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**6. Answer the question**

3. What are the genotypic and phenotypic ratios of the following crosses for blood type. Which cross can yield children with all blood types?

a) IAIA x ii

b) IAIA x IBi

c) IAi x IBi

**Incomplete Dominance and Codominance Problems**

*Whenever I condense all the problems onto a page to save space, you all write very small, so instead, I am leaving you PLENTY of space, so USE IT!!!!! ☺*

*(oh, and don’t expect such a luxury to happen too often…)*

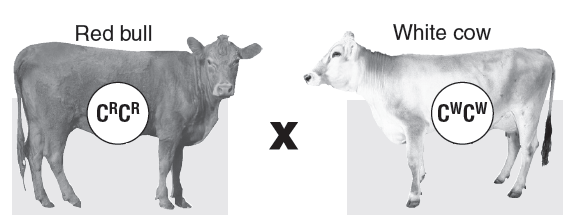
1. Explain the difference between complete dominance, incomplete dominance and codominance. Use a non-genetics example to explain each.
2. Classify the following crosses as examples of complete dominance, incomplete dominance, or codominance.
   1. Yellow Corn x Red Corn – Red Corn \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Brown dog x White dog – Brown spotted dog \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Yellow Fish x Red Fish – Orange Fish \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   4. Blue flower x yellow flower – 1 blue : 2 green : 1 yellow flower

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3. A plant breeder wants to produce flowers for sale that are only pink or white (no red!). Determine the phenotypes of the two parents necessary to produce these offspring. Draw the Punnett square for this cross.

4. A plant breeder crossed two plants of the plant variety known as Japanese four o’clock. This plant is known to have its flower colour controlled by a gene which possesses incomplete dominant alleles. Pollen from a pink flowered plant was placed on the stigma of a red flowered plant. What are the genotypes and phenotypes for the parents and offspring.

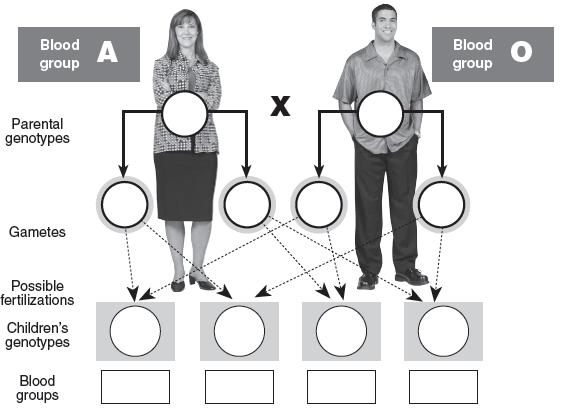
5. A yellow guinea pig is crossed with a cream one. Yellow is not completely dominant over white. The heterozygous condition results in a cream colour. Give the phenotype and genotype ratios for the offspring.

6. In the shorthorn cattle breed, coat colour is inherited. White shorthorn parents always produce calves with white coats. Red shorthorn parents always produce calves with red coats. But when a red parent mates with a white parent, the calves have a coat colour that is different from either parent called roan (a mixture of red and white hairs). The red and white hairs are expressed equally and independently (i.e. they are not blended to produce pink hairs!). Draw the Punnett square for the following cross and determine the genotypic and phenotypic ratios for the offspring.

7. In Andalusian fowl, the heterozygous condition of the alleles for black plumage and white plumage is blue. What offspring (in what ratios) will a blue Andalusian fowl have if bred to birds of the following plumage?

a) black b) blue c) white

8. A woman is heterozygous for blood group A and a man has blood group O.



* 1. Give the genotypes of each parent (fill in the spaces on the diagram to the right).
  2. Determine the probability of:

One child having blood group O: \_\_\_\_\_\_\_ %

One child having blood group A: \_\_\_\_\_\_\_ %

One child having blood group AB: \_\_\_\_\_\_ %

9. Agatha who has type A blood marries Bill who is type B blood. They have a child, Oscar with type O blood. What does this tell you about the parent’s genotypes? What is the probability of their newborn son, Cory, will have type AB blood?

10. Several years later, the whole family just got into tragic car accident, and all need blood. Immediately. Thankfully, they saved some at home for just this scenario.

Draw arrows between the four family members to show who can donate blood to whom. The arrow should points in the direction of the donation, from donor to recipient.

Agatha Bill

Oscar Cory

**Challenge Questions:**

11. Can you think of any traits for which it may be hard to determine whether inheritance is incompletely dominant or codominant?

12. A yellow long haired guinea pig is crossed with a short haired cream one. Yellow is not completely dominant over white (the heterozygous condition results in a cream colour), but hair length behaves according to standard mendelian genetics (short = dominant). Give the phenotypic ratios for the offspring.

13. The Rhesus factor (Rh) in blood is another protein contained on red blood cells. Some people have it, and are called Rhesus Positive (+) and others don’t (Rhesus negative (-). The rhesus allele (Rh+, Rh-) behaves according to the principle of complete dominance, with Rh+ being dominant. One can also express blood types in terms of their A/B/O status and their Rhesus status, such as AB+ or O-, The two genes assort independently. What would be the phenotypic ratios of the offspring of:

a) IAIBRh+Rh+  and iiRh-Rh-

b) ABRh+ male and B+ female who managed to produce an A- child